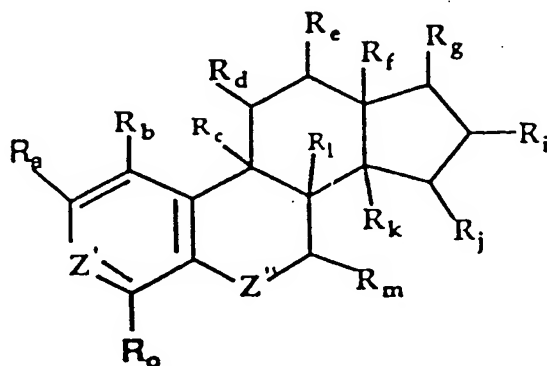


Claims

- 1 1. A method for treating a mammalian disease
2 characterized by abnormal cell mitosis, said method
3 comprising administering to a mammal a cell-mitosis-
4 inhibiting compound of the formula below, said compound
5 being administered in an amount sufficient to inhibit cell
6 mitosis:

7



8 wherein:

9 I. R_a - R_o are defined as follows:

- 10 A) each R_a , R_b , R_c , R_d , R_e , R_f , R_i , R_j , R_k , R_l ,
11 R_m , R_o , independently is $-R_1$, $-OR_1$,

12 $-\text{OCOR}_1, -\text{SR}_1, -\text{F}, -\text{NHR}_2, -\text{Br}, \text{ or } -\text{I}; \text{ and } \text{R}_g$
 13 $\text{is } -\text{R}_1, -\text{OR}_1, -\text{OCOR}_1, -\text{SR}_1, -\text{F}, -\text{NHR}_2, -\text{Br},$
 14 $-\text{I}, \text{ or } -\text{C}\equiv\text{CH};$

15 or

16 B) each $\text{R}_a, \text{R}_b, \text{R}_c, \text{R}_f, \text{R}_k, \text{R}_l, \text{R}_o,$
 17 independently is $-\text{R}_1, -\text{OR}_1, -\text{OCOR}_1, -\text{SR}_1,$
 18 $-\text{F}, -\text{NHR}_2, -\text{Br}, \text{ or } -\text{I}; \text{ and each } \text{R}_d, \text{R}_e, \text{R}_i,$
 19 $\text{R}_j, \text{R}_m, \text{ independently is } =\text{O}, -\text{R}_1, -\text{OR}_1,$
 20 $-\text{OCOR}_1, -\text{SR}_1, -\text{F}, -\text{NHR}_2, -\text{Br} \text{ or } -\text{I}; \text{ and } \text{R}_g$
 21 $\text{is } =\text{O}, -\text{R}_1, -\text{OR}_1, -\text{OCOR}_1, -\text{SR}_1, -\text{F}, -\text{NHR}_2,$
 22 $-\text{Br}, -\text{I}, \text{ or } -\text{C}\equiv\text{CH};$

23 and

24 II. Z' is defined as follows:

25
 26
 27 A) Z' is X , where X is $\overset{\text{O}}{\underset{|}{>\text{C}}}\text{OR}_1, \overset{\text{O}}{\underset{|}{>\text{C}}}\text{C}-\text{R}_1,$
 28
 29 $\overset{\text{O}}{\underset{|}{>\text{C}}}\text{C}-\text{OR}_1, \overset{\text{OH}}{\underset{|}{>\text{C}}}\text{C}-\text{R}_1, \overset{\text{OH}}{\underset{|}{>\text{C}}}\text{C}-\text{OR}_1;$
 30

31 or

32 B) Z' is $=\text{C}-\text{X}'-$ or $-\text{X}'-\text{C}=$, where R_n
 33 $\underset{|}{\text{R}_n} \qquad \qquad \underset{|}{\text{R}_n}$
 34
 35 is $-\text{R}_1, -\text{OR}_1, -\text{SR}_1, -\text{F}, -\text{NHR}_2, -\text{Br} \text{ or } -\text{I};$
 36 and X' is X , as defined above; or X' is
 37 $>\text{C}=\text{O};$

38 and

39 III. Z'' is defined as follows:

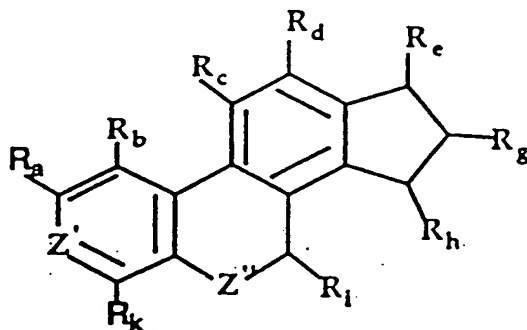
40
 41
 42 A) Z'' is Y , where Y is $-\text{O}-, -\text{N}-, \overset{\text{R}_1}{\underset{|}{>\text{C}}}\text{HR}_1,$
 43
 44 $\overset{\text{R}_1}{\underset{|}{>\text{C}}}=\text{O}, \overset{\text{R}_1}{\underset{|}{>\text{C}}}-(\text{CH}_2)_n\text{OR}_2,$
 45

- 46
47
48 $\begin{array}{c} R_1 \quad \quad O \quad \quad R_1 \quad \quad O \\ | \quad \quad | \quad \quad | \quad \quad | \\ >C-(CH_2)_n-CR_2, >C-(CH_2)_n-C-OR_2, \end{array}$
- 49
50
51 $\begin{array}{c} R_1 \quad \quad OH \quad \quad R_1 \quad \quad OH \\ | \quad \quad | \quad \quad | \quad \quad | \\ >C-(CH_2)_n-CHR_2, >C-(CH_2)_n-CH-OR_2, \end{array}$
- 52
53
54 $\begin{array}{c} R_1 \quad \quad O \quad \quad R_1 \quad \quad OH \\ | \quad \quad | \quad \quad | \quad \quad | \\ >C-NH(CH_2)_n-CR_2, >C-NH(CH_2)_n-CHR_2, \end{array}$
- 55
56
57 $\begin{array}{c} R_1 \quad \quad OH \\ | \quad \quad | \\ >C-NH(CH_2)_n-CH-OR_2, \end{array}$
- 58
59
60 $\begin{array}{c} R_1 \quad \quad O \quad \quad R_1 \\ | \quad \quad | \quad \quad | \\ >C-NH(CH_2)_n-C-OR_2, >C-NH(CH_2)_n-OR_2 \end{array}$
- 61
62
63 $\begin{array}{c} R_1 \quad \quad \quad R_1 \quad \quad O \\ | \quad \quad \quad | \quad \quad | \\ >C-NH(CH_2)_n-R_2, >C(CH_2)_nNHCR_2, \end{array}$
- 64
65
66 $\begin{array}{c} R_1 \quad \quad O \\ | \quad \quad | \\ >C-(CH_2)_n-NHC-OR_2, \end{array}$
- 67
68
69 $\begin{array}{c} R_1 \quad \quad OH \quad \quad R \quad \quad OH \\ | \quad \quad | \quad \quad | \quad \quad | \\ >C-(CH_2)_n-NH-CHR_2, >C-(CH_2)_n-NH-COR_2, \text{ or} \end{array}$
- 70
71
72 $\begin{array}{c} R_1 \\ | \\ >C-(CH_2)_n-NH-CH_2OR_2, \text{ where } n \text{ is } 0-6; \end{array}$
- 73 or
- 74 B) $\begin{array}{c} Z'' \text{ is } -Y-CH- \text{ or } -CH-Y- \text{ where } R_p \\ | \quad \quad | \\ R_p \quad \quad R_p \end{array}$
- 75
76
77 is $-R_1, -OR_1, -SR_1, -F, -NHR_2, -Br \text{ or } -I;$
- 78 and
- 79 IV. provided that when each $R_b, R_c, R_d, R_e, R_i, R_j, R_k,$
80 R_l, R_m and R_o is H;
81 R_f is $-CH_3;$

82 R_g is $-OH$;
 83 Z' is $>COH$; and
 84 Z'' is $>CH_2$;
 85 then R_a is not $-H$;
 86 where, in each formula set forth above, each R_1 and R_2
 87 independently is $-H$, or substituted or unsubstituted alkyl,
 88 alkenyl or alkynyl group of 1-6 carbons.

1 2. A method for treating a mammalian disease
 2 characterized by abnormal cell mitosis, said method
 3 comprising administering to a mammal a cell-mitosis-
 4 inhibiting compound of the formula below, said compound
 5 being administered in an amount sufficient to inhibit cell
 6 mitosis:

7



8 wherein:

9 I. R_a-R_k are defined as follows:

10 A) each $R_a, R_b, R_c, R_d, R_g, R_h, R_i, R_k$
11 independently is $-R_1, -OR_1, -OCOR_1, -SR_1,$
12 $-F, -NHR_2, -Br, \text{ or } -I$; and R_e is $-R_1, -OR_1,$
13 $-OCOR_1, -SR_1, -F, -NHR_2, -Br, -I$ or $-C\equiv CH$;

14 or

15 B) each R_a, R_b, R_c, R_d, R_k , independently is
16 $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br, \text{ or }$
17 $-I$; and each R_{eg}, R_h, R_i , independently is
18 $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F, -Br, \text{ or }$
19 $-I$; and R_e is $=O, -R_1, -OR_1, -OCOR_1, -SR_1,$
20 $-F, -Br, -I$ or $-C\equiv CH$;

21 and

22 II. Z' is defined as follows:

23
24
25 A) Z' is X, where X is $\overset{O}{\underset{|}{>COR_1}}, \overset{O}{\underset{|}{>CC-R_1}},$

26
27 $\overset{O}{\underset{|}{>CC-OR_1}}, \overset{OH}{\underset{|}{>CC-R_1}}, \overset{OH}{\underset{|}{>C-C-OR_1}};$
28

29 or

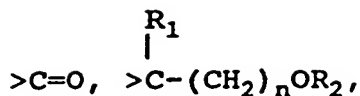
30 B) Z' is $\overset{O}{\underset{|}{>C-X'-}}, \text{ or } -X'-\overset{O}{\underset{|}{>C}},$ where R_n
31 $\underset{|}{R_n} \quad \quad \quad \underset{|}{R_n}$
32
33 is $-R_1, -OR_1, -SR_1, -F, -NHR_2, -Br$ or $-I,$
34 and X' is X, as defined above;
35 or X' is also $>C=O$;

36 and

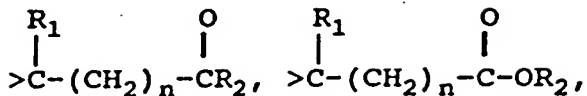
37 III. Z'' is defined as follows:

38
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40 A) Z'' is Y, where Y is $-O-, -N-, \overset{R_1}{\underset{|}{>CHR_1}},$

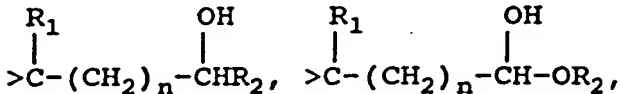
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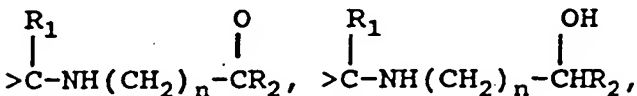
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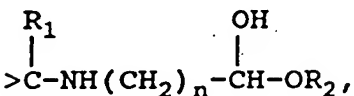
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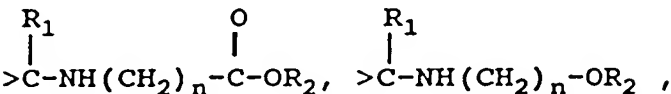
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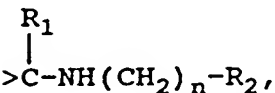
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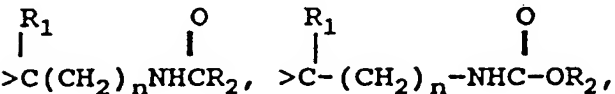
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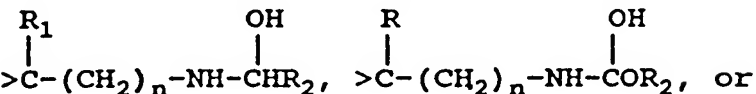
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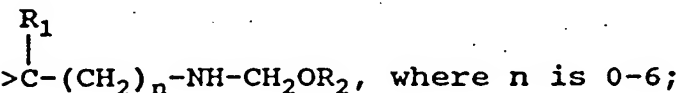
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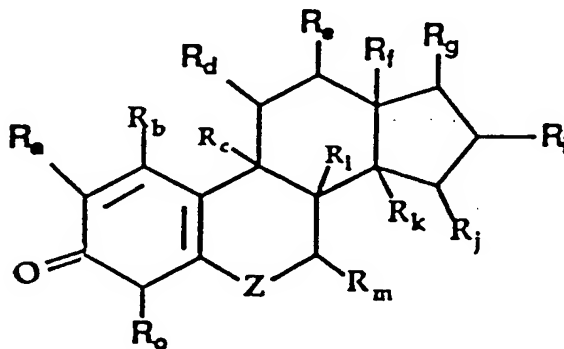
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B) Z" is $\begin{array}{c} -Y-CH- \\ | \\ R_p \end{array}$ or $\begin{array}{c} -CH-Y- \\ | \\ R_p \end{array}$, where R_p is $-R_1, -OR_1, -SR_1, -F, -NHR_2, -Br$ or $-I$;

76 where, in each formula set forth above, each R_1 and R_2
77 independently is -H, or substituted or unsubstituted alkyl,
78 alkenyl or alkynyl group of 1-6 carbons.

1 3. A method for treating a mammalian disease
2 characterized by abnormal cell mitosis, said method
3 comprising administering to a mammal a cell-mitosis-
4 inhibiting compound of the formula below, said compound
5 being administered in an amount sufficient to inhibit cell
6 mitosis:

7



8 wherein:

9 I. R_a - R_o are defined as follows:

10 A) each R_a , R_b , R_c , R_d , R_e , R_f , R_i , R_j , R_k , R_l ,
11 R_m , R_o independently is $-R_1$, $-OR_1$, $-OCOR_1$,
12 $-SR_1$, $-F$, $-NHR_2$, $-Br$, or $-I$; and R_g is $-R_1$,
13 $-OR_1$, $-OCOR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$, $-I$ or
14 $-C\equiv CH$;

15 or

16

B) each $R_a, R_b, R_c, R_f, R_k, R_l$, independently
17 is $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br,$
18 or $-I$; and each $R_d, R_e, R_i, R_j, R_m, R_o$
19 independently is $=O, -R_1, -OR_1, -OCOR_1,$
20 $-SR_1, -F, -NHR_2, -Br,$ or $-I$; and R_g is $=O,$
21 $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br, -I$
22 or $-C\equiv CH$;

23 and

24 II. Z is defined as follows:

25

26

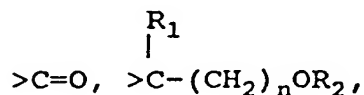
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A) Z is Y, where Y is $-O-, -N-, >CHR_1,$

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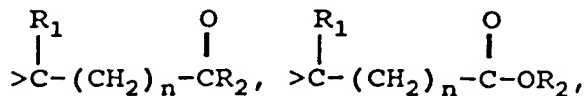
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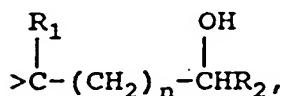
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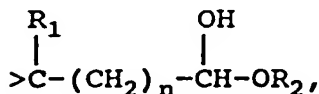
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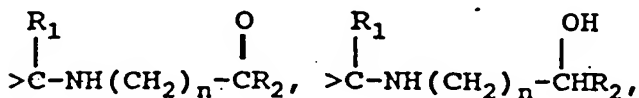
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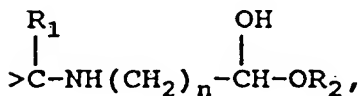
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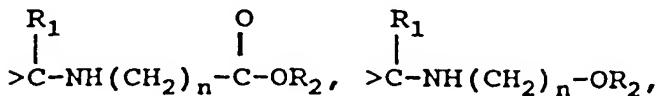
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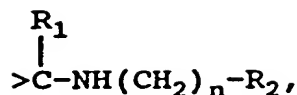
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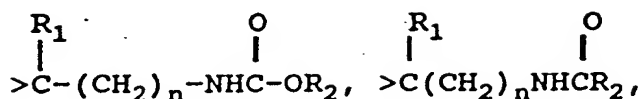
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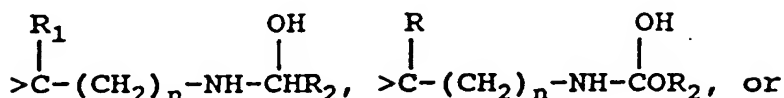
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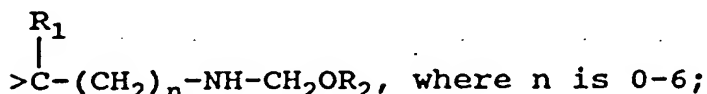
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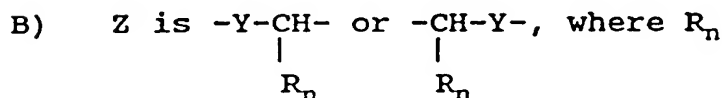


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62 or

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is $-R_1$, $-OR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$ or $-I$;

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where, in each formula set forth above, each R_1 and R_2

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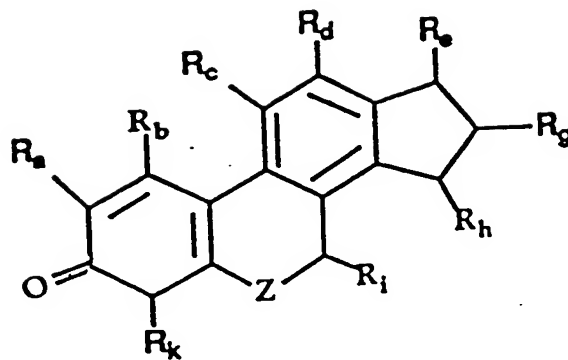
independently is $-H$, or substituted or unsubstituted alkyl,

69

alkenyl or alkynyl group of 1-6 carbons.

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4. A method for treating a mammalian disease characterized by abnormal cell mitosis, said method comprising administering to a mammal a cell-mitosis-inhibiting compound of the formula below, said compound being administered in an amount sufficient to inhibit cell mitosis:



7 wherein:

8 I. R_a - R_k are defined as follows:

9 A) each R_a , R_b , R_c , R_d , R_g , R_h , R_i , R_k
 10 independently is $-R_1$, $-OR_1$, $-OCOR_1$, $-SR_1$,
 11 $-F$, $-NHR_1$, $-Br$, or $-I$; and R_e is $-R_1$, $-OR_1$,
 12 $-OCOR_1$, $-SR_1$, $-F$, $-NHR_1$, $-Br$, $-I$ or $-C\equiv CH$;

13 or

14 B) each R_a , R_b , R_c , R_d , independently is $-R_1$,
 15 $-OR_1$, $-OCOR_1$, $-SR_1$, $-F$, $-NHR_1$, $-Br$, or $-I$
 16 and each R_g , R_h , R_i , R_k independently is
 17 $=O$, $-R_1$, $-OR_1$, $-OCOR_1$, $-SR_1$, $-F$, $-NHR_1$, $-Br$
 18 or $-I$; and R_e is $=O$, $-R_1$, $-OR_1$, $-OCOR_1$,
 19 $-SR_1$, $-F$, $-NHR_1$, $-Br$, $-I$ or $-C\equiv CH$;

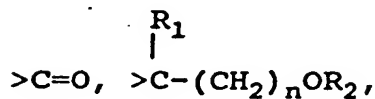
20 and

21 II. Z is defined as follows:

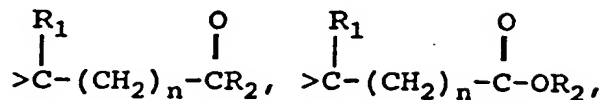
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A) Z is Y, where Y is $\begin{array}{c} \text{R}_1 \\ | \\ -\text{O}-, -\text{N}-, >\text{CHR}_1, \end{array}$

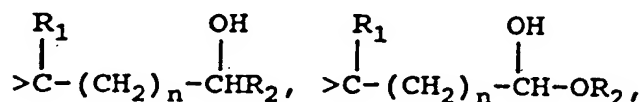
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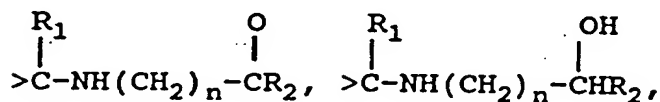
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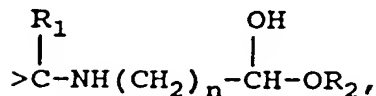
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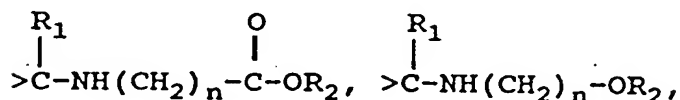
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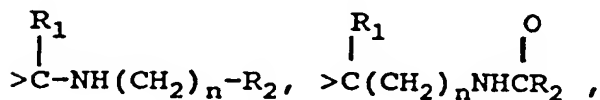
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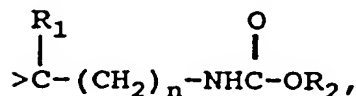
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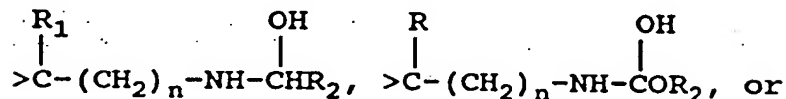
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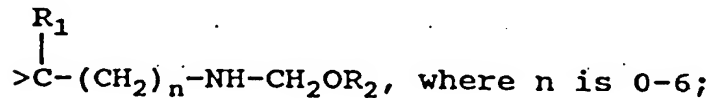
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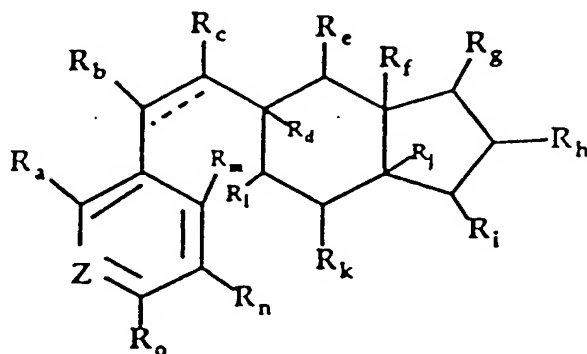
55 or

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57
58

B) Z is $\begin{array}{c} -\text{Y}-\text{CH}- \\ | \\ \text{R}_n \end{array}$ or $\begin{array}{c} -\text{CH}-\text{Y}- \\ | \\ \text{R}_n \end{array}$, where R_n

59 is $-R_1$, $-OR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$ or $-I$;
 60 where, in each formula set forth above, each R_1 and R_2
 61 independently is $-H$, or substituted or unsubstituted alkyl,
 62 alkenyl or alkynyl group of 1-6 carbons.

1 5. A method for treating a mammalian disease
 2 characterized by abnormal cell mitosis; said method
 3 comprising administering to a mammal a cell-mitosis-
 4 inhibiting compound of the formula below, said compound
 5 being administered in an amount sufficient to inhibit cell
 6 mitosis:
 7



8 wherein:

9 I. R_a-R_o are defined as follows:

10 A) each R_a , R_b , R_c , R_d , R_e , R_f , R_g , R_h , R_j , R_k ,
 11 R_l , R_m , R_n , R_o independently is $-R_1$, $-OR_1$,
 12 $-OCOR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$, or $-I$; and R_i
 13 is $-R_1$, $-OR_1$, $-OCOR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$,
 14 $-I$ or $-C\equiv CH$;

15 or

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23 or

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30

B) each $R_a, R_d, R_f, R_j, R_m, R_n, R_o$ independently is $-R_1, -OR_1, -OCR_1, -SR_1, -F, -NHR_2, -Br$, or $-I$; and each $R_b, R_c, R_e, R_g, R_h, R_k, R_l$ independently is $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br$ or $-I$; and R_i is $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F, -Br, -I$ or $-C\equiv CH$;

C) each $R_a, R_b, R_c, R_d, R_f, R_j, R_m, R_n, R_o$ independently is $-R_1, -OR_1, -OCR_1, -SR_1, -F, -NHR_2, -Br, -I$ and each R_e, R_g, R_h, R_k, R_l independently is $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br$ or $-I$; and R_i is $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F, -Br, -I$ or $-C\equiv CH$;

31 II. Z is defined as follows:

32

33

34

A) Z is X, where X is $>COR_1, >\overset{O}{\underset{|}{CC}}-R_1, >\overset{O}{\underset{|}{CC}}-OR_1,$

35

36

37

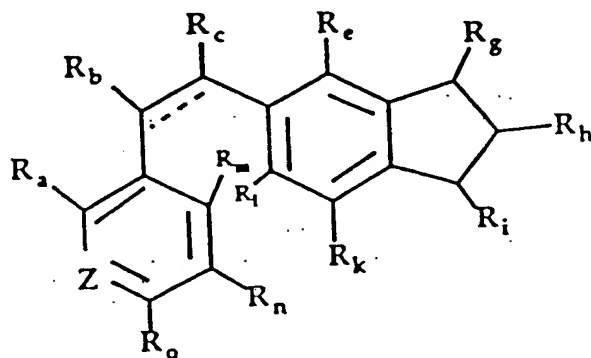
$>\overset{OH}{\underset{|}{CC}}-R_1, >\overset{OH}{\underset{|}{CC}}-OR;$

38 or

39 B) Z is $\begin{array}{c} \text{=C-X'-} \\ | \\ \text{R}_p \end{array}$ or $\begin{array}{c} \text{-X'-C=} \\ | \\ \text{R}_p \end{array}$, where R_p
 40
 41
 42 is $-\text{R}_1$, $-\text{OR}_1$, $-\text{SR}_1$, $-\text{F}$, $-\text{NHR}_2$, $-\text{Br}$ or $-\text{I}$;
 43 and X' is X , as defined above;
 44 or X' is $>\text{C}=\text{O}$;
 45 where, in each formula set forth above, each R_1 and R_2
 46 independently is $-\text{H}$, or substituted or unsubstituted alkyl,
 47 alkenyl or alkynyl group of 1-6 carbons; and the bond
 48 indicated by $\text{C}\bullet\bullet\bullet\text{C}$ is absent or, in combination with the $\text{C}-\text{C}$
 49 bond, is the unit $\text{HC}=\text{CH}$.

1 6. A method for treating a mammalian disease
 2 characterized by abnormal cell mitosis, said method
 3 comprising administering to a mammal a cell-mitosis-
 4 inhibiting compound of the formula below, said compound
 5 being administered in an amount sufficient to inhibit cell
 6 mitosis:

7



8 wherein:

9 I. R_a-R_o are defined as follows:

10 A) each $R_a, R_b, R_c, R_e, R_g, R_h, R_k, R_l, R_m, R_n,$
11 R_o independently is $-R_1, -OR_1, -OCOR_1,$
12 $-SR_1, -F, -NHR_2, -Br,$ or $-I$; and R_i is $-R_1,$
13 $-OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br, -I$ or
14 $-C\equiv CH$;

15 or

16 B) each $R_a, R_e, R_l, R_m, R_n, R_o$ independently
17 is $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br,$
18 $-I$ and each R_b, R_c, R_g, R_h is $=O, -R_1,$
19 $-OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br$ or $-I$;
20 and R_i is $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F,$
21 $-NHR_1, -Br, -I$ or $-C\equiv CH$;

22 or

23 C) each $R_a, R_b, R_c, R_e, R_k, R_m, R_n, R_o$
24 independently is $-R_1, -OR_1, -OCOR_1, -SR_1,$
25 $-F, -NHR_2, -Br, -I$, and each R_h, R_l
26 independently is $=O, -R_1, -OR_1, -OCOR_1,$
27 $-SR_1, -F, -NHR_1, -Br$ or $-I$; and R_i is $=O,$
28 $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br, -I$
29 or $-C\equiv CH$;

30 and

31 I. Z is defined as follows:

32
33 A) Z is X , where X is $>COR_1, >\overset{O}{\underset{|}{CC}}-R_1, >\overset{O}{\underset{|}{CC}}-OR_1,$
34

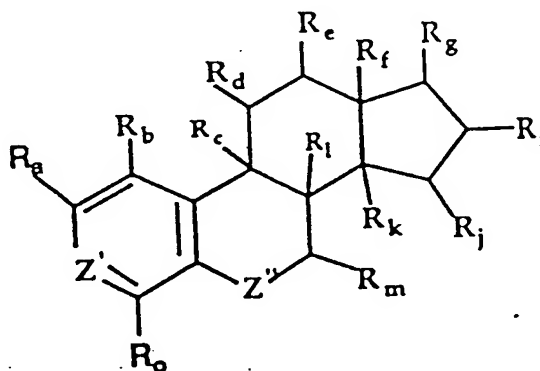
35 $>\overset{OH}{\underset{|}{CC}}-R_1, >\overset{OH}{\underset{|}{CC}}-OR;$
36
37

38 or

39 B) Z is $\begin{array}{c} \text{C}-\text{X}'- \\ | \\ \text{R}_p \end{array}$ or $\begin{array}{c} -\text{X}'-\text{C}= \\ | \\ \text{R}_p \end{array}$, where R_p
 40
 41
 42 is $-\text{R}_1$, $-\text{OR}_1$, $-\text{SR}_1$, $-\text{F}$, $-\text{NHR}_2$, $-\text{Br}$ or $-\text{I}$,
 43 and X' is X , as defined above;
 44 or X' is $=\text{O}$;
 45 where, in each formula set forth above, each R_1 and R_2
 46 independently is $-\text{H}$, or substituted or unsubstituted alkyl,
 47 alkenyl or alkynyl group of 1-6 carbons; and the bond
 48 indicated by $\text{C}\bullet\bullet\bullet\text{C}$ is absent or, in combination with the $\text{C}-\text{C}$
 49 bond is the unit $\text{HC}=\text{CH}$.

1 7. A compound of the general formula below, said
 2 compound being a cell-mitosis-inhibiting compound:

3



4 wherein:

5 I. R_a-R_o are defined as follows:

6 (A) each $R_a, R_b, R_c, R_d, R_e, R_f, R_i, R_j, R_k, R_l,$
7 R_m, R_o , independently is $-R_1, -OR_1,$
8 $-OCOR_1, -SR_1, -F, -NHR_2, -Br$, or $-I$; and R_g
9 is $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br,$
10 $-I$ or $-C\equiv CH$;

11 or

12 (B) each $R_a, R_b, R_c, R_f, R_k, R_l, R_o$, is $-R_1,$
13 $-OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br$, or $-I$;
14 and each R_d, R_e, R_i, R_j, R_m , independently
15 is $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2,$
16 $-Br$ or $-I$; and R_g is $=O, -R_1, -OR_1, -OCOR_1,$
17 $-SR_1, -F, -NHR_2, -Br, -I$ or $-C\equiv CH$;

18 and

19 II. Z' is defined as follows:

20
21
22 A) Z' is X , where X is $\overset{O}{\underset{|}{>CC-OR_1}}, \overset{O}{\underset{|}{>CC-R_1}},$

23
24
25 $\overset{O}{\underset{|}{>CC-OR_1}}, \overset{OH}{\underset{|}{>CC-R_1}}, \overset{OH}{\underset{|}{>CC-OR_1}};$

26 or

27 B) Z' is $\underset{\underset{R_n}{|}}{=C-X'-} \text{ or } \underset{\underset{R_n}{|}}{-X'-C=}$, where R_n
28
29

30 is $-R_1, -OR_1, -SR_1, -F, -NHR_2, -Br$ or $-I$;
31 or X' is X , as defined above; or
32 X' is $>C=O$;

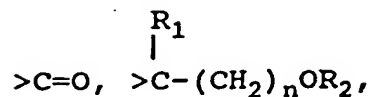
33 and

34 III. Z'' is defined as follows:

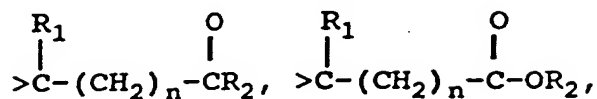
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A) Z'' is Y, where Y is $-O-$, $-\overset{\overset{R_1}{|}}{N}-$, $>CHR_1$,

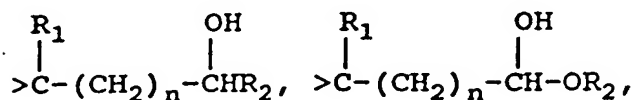
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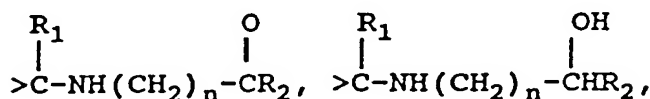
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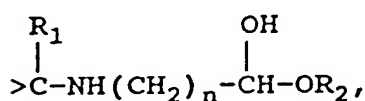
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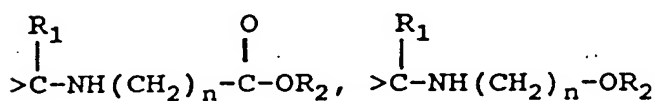
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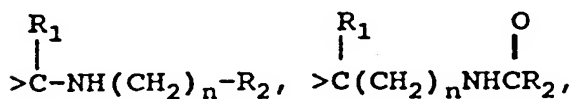
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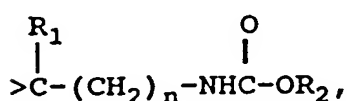
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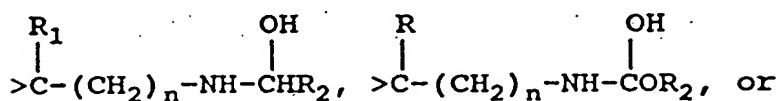
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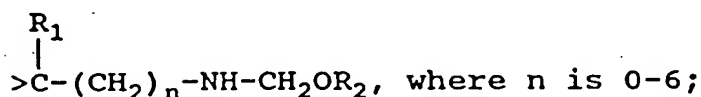
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68 or

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71

B) Z'' is $-Y-\overset{\overset{R_p}{|}}{CH}-$ or $-\overset{\overset{R_p}{|}}{CH}-Y-$ where R_p

72 is $-R_1, -OR_1, -SR_1, -F, -NHR_2, -Br$ or $-I$;
73 provided that when:

74 3) each $R_b, R_c, R_d, R_e, R_j, R_k, R_l, R_m$ is $-H$;
75 R_f is $-CH_3$;

76 R_g is $-OH, -OCCH_3$;
77 R_i is $-H, -OH$, or $=O$;
78 R_o is $-H$ or $-Br$;

79 Z' is $>COH$; and

80 Z'' is $>CH_2$ or $-OH$; then

81 R_a is not $-F, -Br, -OH$ or $-H$;

82 and

83 4) each $R_b, R_c, R_d, R_e, R_i, R_j, R_k, R_l,$

84 R_m is $-H$;

85 R_f is $-CH_3$;

86 R_g is $-OH$; and

87 Z'' is $>CH_2$; then

88 Z' is not $>COCH_3$ or $>COCCH_3$; and

89 each R_a, R_o independently or together are

90 not $-OCH_3$ or $-H$;

91 and

92 5) each $R_c, R_e, R_j, R_k, R_l, R_m, R_o$ is $-H$;

93 R_a is $-H$ or $-OCH_3$;

94 R_b is $-H$ or $-CH_3$;

95 R_d is $-OH$;

100 R_f is $-CH_3$;

101 R_g is $=O$;

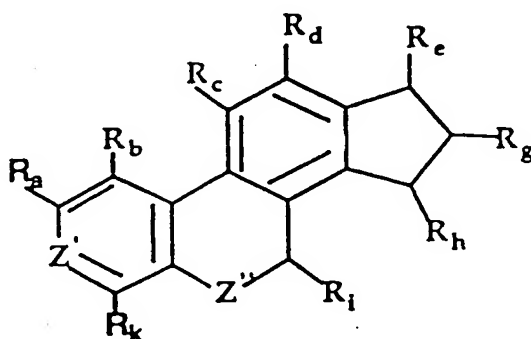
102 R_i is $-OH, =O$ or $-C\equiv CH$; and

103 Z'' is $>CH_2$; then

104 Z' is not $>COH; >COCCH_3$, or $-H$;

107 where, in each formula set forth above, each R_1 and R_2
108 independently is -H, or substituted or unsubstituted alkyl,
109 alkenyl or alkynyl group of 1-6 carbons.

1 8. A compound of the general formula below, said
2 compound being a cell-mitosis-inhibiting compound:



4 wherein:

5 I. R_a - R_k are defined as follows:

- 6 A) each R_a , R_b , R_c , R_d , R_g , R_h , R_i , R_k
7 independently is $-R_1$, $-OR_1$, $-OCOR_1$, $-SR_1$,
8 $-F$, $-NHR_2$, $-Br$, or $-I$; and R_e is $-R_1$, $-OR_1$,
9 $-OCOR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$, $-I$ or $-C\equiv CH$;
10 or
11 B) each R_a , R_b , R_c , R_d , R_k , is $-R_1$, $-OR_1$,
12 $-OCOR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$, or $-I$; and
13 each R_g , R_h , R_i , independently is $=O$,

14 $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -Br, \text{ or } -I;$
 15 and R_e is $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F,$
 16 $-Br, -I$ or $-C\equiv CH;$

17 and

18 I. Z' is defined as follows:

19
 20
 21 A) Z' is X , where X is $>COR_1, >C_2\overset{\overset{O}{|}}{C}-R_1,$

22
 23
 24 $>C_2\overset{\overset{O}{|}}{C}-OR_1, >CC\overset{\overset{OH}{|}}{C}-R_1, >C\overset{\overset{OH}{|}}{C}-OR_1;$

25 or

26 B) Z' is $=C\overset{\overset{R_n}{|}}{X'}-$ or $-X'\overset{\overset{R_n}{|}}{C}=$, where R_n
 27
 28
 29 is $-R_1, -OR_1, -SR_1, -F, -NHR_2, -Br$ or $-I,$
 30 and X' is X , as defined above;
 31 or X' is also $>C=O;$

32 and

33 II. Z'' is defined as follows:

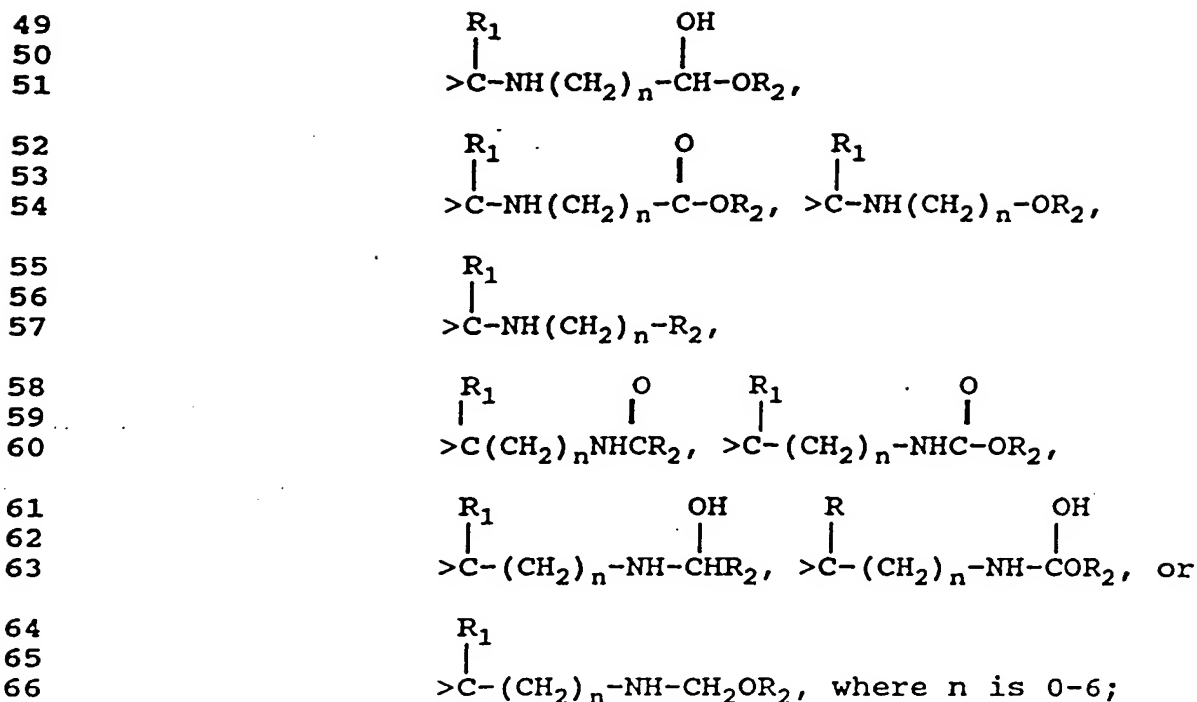
34
 35
 36 A) Z'' is Y , where Y is $-O-, -N-, >CHR_1,$

37
 38
 39 $>C=O, >C\overset{\overset{R_1}{|}}{-(CH_2)_n}OR_2,$

40
 41
 42 $>C\overset{\overset{R_1}{|}}{-(CH_2)_n}\overset{\overset{O}{|}}{C}R_2, >C\overset{\overset{R_1}{|}}{-(CH_2)_n}\overset{\overset{O}{|}}{C}-OR_2,$

43
 44
 45 $>C\overset{\overset{R_1}{|}}{-(CH_2)_n}\overset{\overset{OH}{|}}{C}HR_2, >C\overset{\overset{R_1}{|}}{-(CH_2)_n}\overset{\overset{OH}{|}}{C}-OR_2,$

46
 47
 48 $>C\overset{\overset{R_1}{|}}{NH(CH_2)_n}\overset{\overset{O}{|}}{C}R_2, >C\overset{\overset{R_1}{|}}{NH(CH_2)_n}\overset{\overset{OH}{|}}{C}HR_2,$

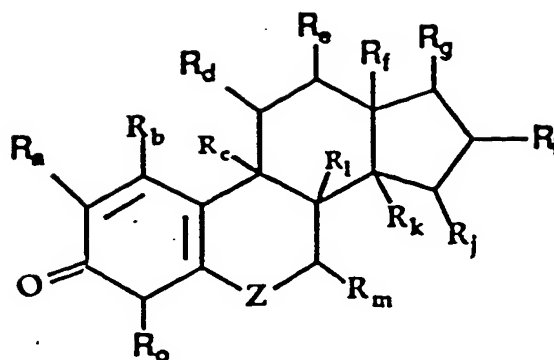


67 or

68 B) Z" is -Y-CH- or -CH-Y-, where R_p is
 69
$$\begin{array}{c} | \quad \quad | \\ R_p \quad \quad R_p \end{array}$$

 70
 71 -R₁, -OR₁, -SR₁, -F, -NHR₂, -Br or -I;
 72 where, in each formula set forth above, each R₁ and R₂
 73 independently is -H, or substituted or unsubstituted alkyl,
 74 alkenyl or alkynyl group of 1-6 carbons.

1 9. A compound of the general formula below, said
 2 compound being a cell-mitosis-inhibiting compound:



3 wherein:

4 I. R_a-R_o are defined as follows:

5 A) each $R_a, R_b, R_c, R_d, R_e, R_f, R_i, R_j, R_k, R_l,$
 6 R_m, R_o independently is $-R_1, -OR_1, -OCOR_1,$
 7 $-SR_1, -F, -NHR_2, -Br, \text{ or } -I$; and R_g is $-R_1,$
 8 $-OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br, -I$ or
 9 $-C\equiv CH$;

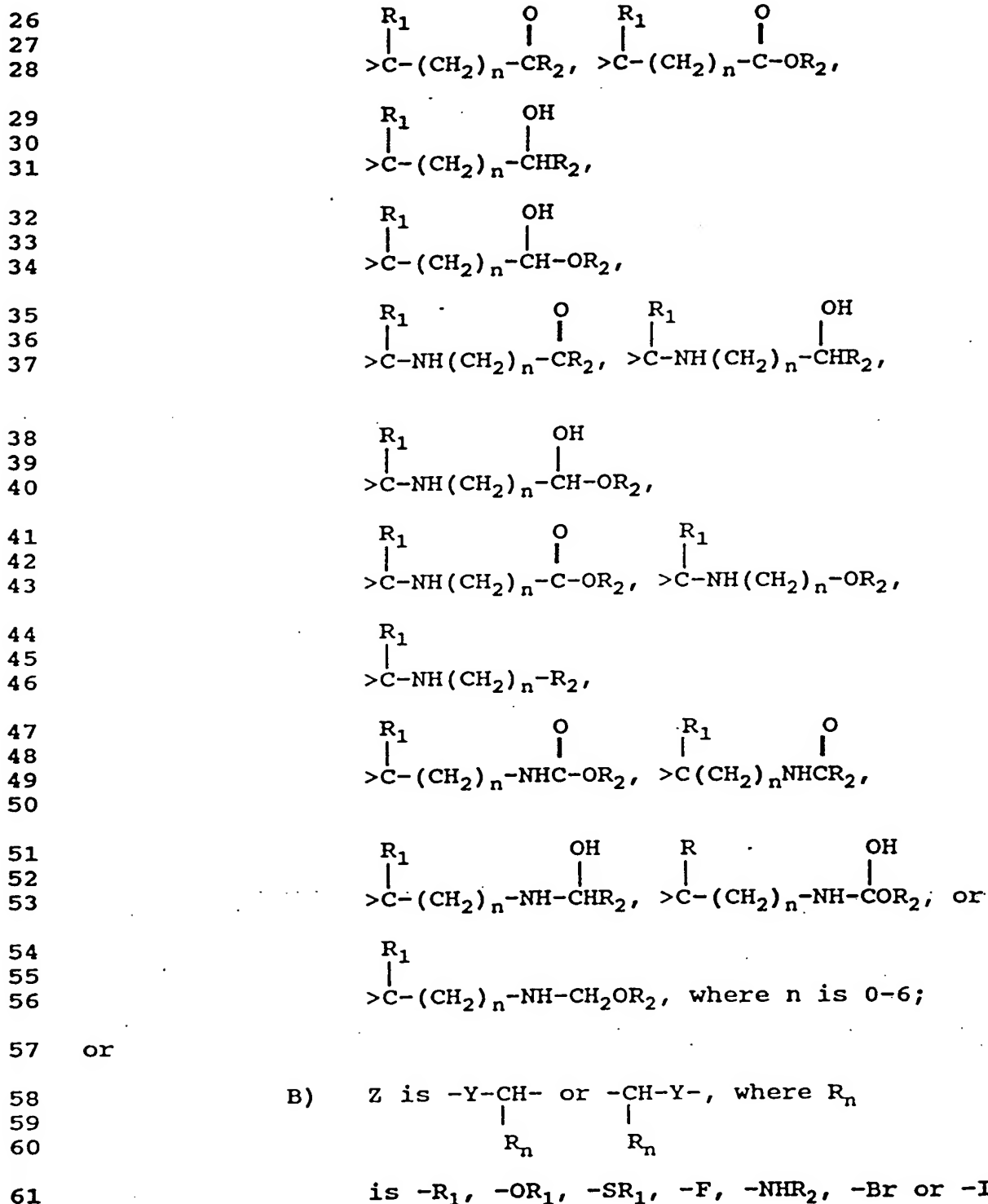
10 or

11 B) each $R_a, R_b, R_c, R_f, R_k, R_l$, independently
 12 is $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br,$
 13 $\text{ or } -I$; and each $R_d, R_e, R_i, R_j, R_m, R_o$
 14 independently is $=O, -R_1, -OR_1, -OCOR_1,$
 15 $-SR_1, -F, -NHR_2, -Br, -I$; and R_g is $=O,$
 16 $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br, -I$
 17 $\text{ or } -C\equiv CH$;

18 and

19 II. Z is defined as follows:

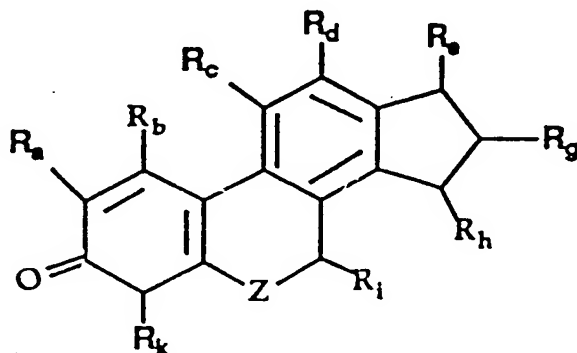
20 A) Z is Y , where Y is $-O-, \overset{R_1}{\underset{|}{N-}}, >CHR_1,$
 21
 22
 23 $\overset{R_1}{\underset{|}{>C=O}}, >C-(CH_2)_nOR_2,$
 24
 25



62 where, in each formula set forth above, each R_1 and R_2
63 independently is -H, or substituted or unsubstituted alkyl,
64 alkenyl or alkynyl group of 1-6 carbons.

1 10. A compound of the general formula below, said
2 compound being a cell-mitosis-inhibiting compound:

3



4 wherein:

5 I. R_a-R_k are defined as follows:

6 A) each $R_a, R_b, R_c, R_d, R_g, R_h, R_i, R_k$
7 independently is $-R_1, -OR_1, -OCOR_1, -SR_1,$
8 $-F, -NHR_1, -Br, \text{ or } -I$; and R_e is $-R_1, -OR_1,$
9 $-OCOR_1, -SR_1, -F, -NHR_1, -Br, -I$ or $-C\equiv CH$;

10 or

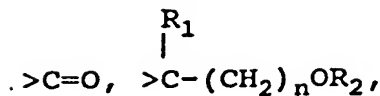
11 B) each R_a, R_b, R_c, R_d , independently is $-R_1,$
12 $-OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br, \text{ or } -I$;
13 and each R_g, R_h, R_i, R_k independently is
14 $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br$
15 or $-I$; and R_e is $-R_1, -OR_1, -OCOR_1, -SR_1,$
16 $-F, -NHR_1, -Br, -I$ or $-C\equiv CH$;

17 II. Z is defined as follows:

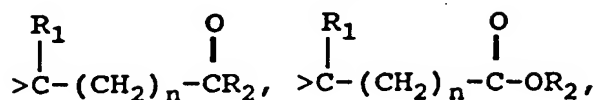
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1) Z is Y, where Y is $\overset{\text{R}_1}{\underset{|}{\text{O}}}$ -, $\overset{\text{R}_1}{\underset{|}{\text{N}}}$ -, $>\text{CHR}_1$,

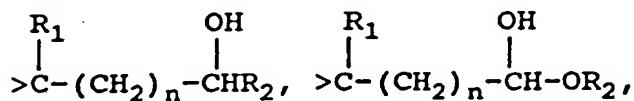
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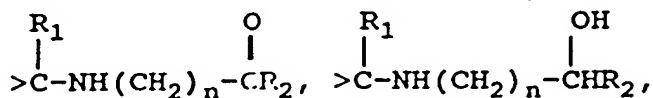
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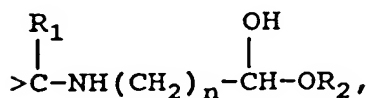
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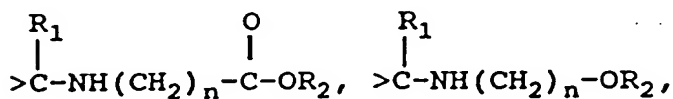
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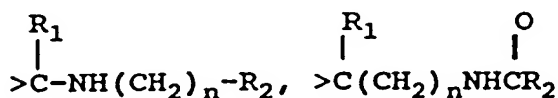
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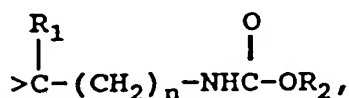
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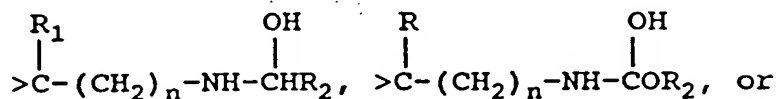
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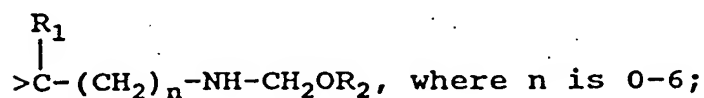
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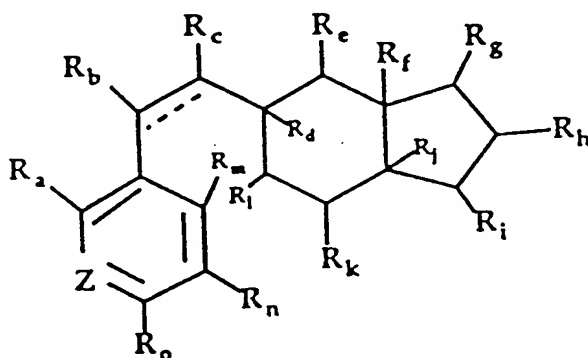
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51 or

52 Z is $-Y-CH-$ or $-CH-Y-$, where R_n
 53 $\quad \quad \quad | \quad \quad \quad |$
 54 $\quad \quad \quad R_n \quad \quad R_n$
 55 is $-R_1$, $-OR_1$, $-SR_1$, $-F$,
 56 $-NHR_2$, $-Br$ or $-I$;
 57 where, in each formula set forth above, each R_1 and R_2
 58 independently is $-H$, or substituted or unsubstituted alkyl,
 59 alkenyl or alkynyl group of 1-6 carbons.

1 11. A compound of the general formula below, said
 2 compound being a cell-mitosis-inhibiting compound:
 3



4 wherein:
 5 I. R_a-R_o are defined as follows:
 6 A) each R_a , R_b , R_c , R_d , R_e , R_f , R_g , R_h , R_j , R_k ,
 7 R_l , R_m , R_n , R_o independently is $-R_1$, $-OR_1$,
 8 $-OCOR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$, or $-I$; and R_i
 9 is $-R_1$, $-OR_1$, $-OCOR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$,
 10 $-I$ or $-C\equiv CH$;

11 or

12 B) each $R_a, R_d, R_f, R_j, R_m, R_n, R_o$
13 independently is $-R_1, -OR_1, -OCR_1, -SR_1,$
14 $-F, -NHR_2, -Br, -I$; and each $R_b, R_c, R_e,$
15 R_g, R_h, R_k, R_l independently is $=O, -R_1,$
16 $-OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br$ or $-I$;
17 and R_i is $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F,$
18 $-NHR_1, -Br, -I$ or $-C\equiv CH$;

19 or

20 C) each $R_a, R_b, R_c, R_d, R_f, R_j, R_m, R_n, R_o$
21 independently is $-R_1, -OR_1, OCR_1, -SR_1, -F,$
22 $-NHR_2, -Br, -I$; and each R_e, R_g, R_h, R_k, R_l
23 independently is $=O, -R_1, -OR_1, -OCOR_1,$
24 $-SR_1, -F, -NHR_1, -Br$ or $-I$; and R_i is $=O,$
25 $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br, -I$
26 or $-C\equiv CH$;

27 and

28 I. Z is defined as follows:

29
30
31 1) Z is X, where X is $>COR_1, >\overset{O}{\underset{|}{CC}}-R_1, >\overset{O}{\underset{|}{CC}}-OR_1,$
32 $\overset{OH}{\underset{|}{>CC}}-R_1, \overset{OH}{\underset{|}{>CC}}-OR$; or
33
34

35
36
37

Z is $\begin{array}{c} \text{=C-X'-} \\ | \\ \text{R}_p \end{array}$ or $\begin{array}{c} \text{-X'-C=} \\ | \\ \text{R}_p \end{array}$, where R_p

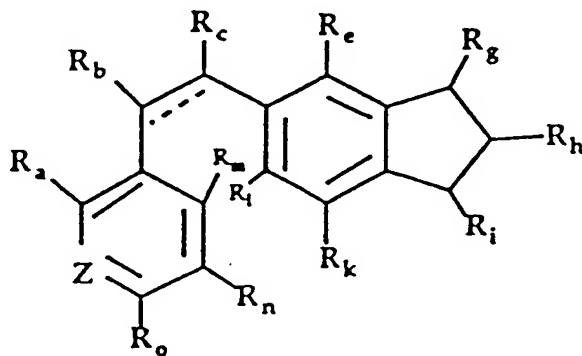
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39
40

is $-\text{R}_1$, $-\text{OR}_1$, $-\text{SR}_1$, $-\text{F}$, $-\text{NHR}_2$, $-\text{Br}$ or $-\text{I}$;
and X' is X , as defined above;
or X' is $>\text{C}=\text{O}$;

41 where, in each formula set forth above, each R_1 and R_2
42 independently is $-\text{H}$, or substituted or unsubstituted alkyl,
43 alkenyl or alkynyl group of 1-6 carbons; and the bond
44 indicated by $\text{C}\bullet\bullet\bullet\text{C}$ is absent or, in combination with the $\text{C}-\text{C}$
45 bond is the unit $\text{HC}=\text{CH}$.

1 12. A compound of the general formula below, said
2 compound being a cell-mitosis-inhibiting compound:

3



4 wherein:

- 5 I. R_a-R_o are defined as follows:
- 6 A) each $R_a, R_b, R_c, R_e, R_g, R_h, R_k, R_l, R_m, R_n,$
7 R_o independently is $-R_1, -OR_1, OCOR_1, -SR_1,$
8 $-F, -NHR_2, -Br, \text{ or } -I$; and R_i is $-R_1, -OR_1,$
9 $-OCOR_1, -SR_1, -F, -NHR_2, -Br, -I$ or $-C\equiv CH$;
- 10 or
- 11 B) each $R_a, R_e, R_l, R_m, R_n, R_o$ independently
12 is $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br,$
13 $-I$; and each R_b, R_c, R_g, R_h is $=O, -R_1,$
14 $-OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br$ or $-I$;
15 and R_i is $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F,$
16 $-NHR_1, -Br, -I$ or $-C\equiv CH$;
- 17 or
- 18 C) each $R_a, R_b, R_c, R_e, R_k, R_m, R_n, R_o$
19 independently is $-R_1, -OR_1, OCOR_1, -SR_1,$
20 $-F, -NHR_2, -Br, -I$; and each R_g, R_h
21 independently is $=O, -R_1, -OR_1, -OCOR_1,$
22 $-SR_1, -F, -NHR_1, -Br$ or $-I$; and R_i is $=O,$
23 $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br, -I$
24 or $-C\equiv CH$;
- 25 and
- 26 II. Z is defined as follows:
- 27
- 28
- 29 A) Z is X , where X is $\overset{O}{\underset{|}{>COR_1}}, \overset{O}{\underset{|}{>CC-R_1}}, \overset{O}{\underset{|}{>CC-OR_1}},$
- 30 $\overset{OH}{\underset{|}{>CC-R_1}}, \overset{OH}{\underset{|}{>CC-OR_1}};$
- 31
- 32
- 33 or
- 34 B) Z is $\underset{\underset{R_p}{|}}{=C-X'-} \text{ or } -X'-\underset{\underset{R_p}{|}}{C=},$ where R_p
- 35
- 36

37 is $-R_1$, $-OR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$ or $-I$,
 38 and X' is X , as defined above;
 39 or X' is $=O$;
 40 where, in each formula set forth above, each R_1 and R_2
 41 independently is $-H$, or substituted or unsubstituted alkyl,
 42 alkenyl or alkynyl group of 1-6 carbons; and the bond
 43 indicated by $C\bullet\bullet\bullet C$ is absent or, in combination with the $C-C$
 44 bond is the unit $HC=CH$.

1 13. The method of claim 1, wherein said
 2 cell-mitosis-inhibiting composition is 2-methoxyestradiol.

1 14. The method of claim 1, wherein said
 2 cell-mitosis-inhibiting composition is 2-fluoroestradiol.

1 15. The method of claim 1, wherein said
 2 cell-mitosis-inhibiting composition is 2-bromoestradiol.

1 16. The method of claim 1, wherein said
 2 cell-mitosis-inhibiting composition is 2-methoxyestrone.

1 17. The method of claim 1, wherein said cell-
 2 mitosis-inhibiting composition is 17-ethynylestradiol.

1 18. The method of claims 1 or 2 wherein said
 2 compound is further characterized in that

3 A) Z' is $=C-X'-$ or $-X'-C=$; and
 4 $\quad \quad \quad | \quad \quad \quad |$
 5 $\quad \quad \quad R_n \quad \quad \quad R_n$
 6 Z'' is $-Y-CH-$ or $-CH-Y-$; or
 7 $\quad \quad \quad | \quad \quad \quad |$
 8 $\quad \quad \quad R_p \quad \quad \quad R_p$
 9 B) Z' is X ; and Z'' is $-Y-CH-$ or $-CH-Y-$; or
 10 $\quad \quad \quad \quad \quad | \quad \quad \quad |$
 11 $\quad \quad \quad \quad \quad R_p \quad \quad \quad R_p$

12 c) Z' is $\begin{array}{c} \text{=C-X'-} \\ | \\ \text{R}_n \end{array}$ or $\begin{array}{c} \text{-X'-C=} \\ | \\ \text{R}_n \end{array}$; and Z" is Y.
 13
 14

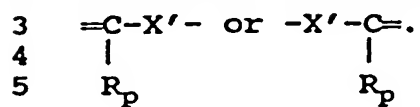
1 19. The method of claims 3 or 4 wherein said
 2 compound is further characterized in that Z is
 3 $\begin{array}{c} \text{-Y-CH-} \\ | \\ \text{R}_n \end{array}$ or $\begin{array}{c} \text{-CH-Y-} \\ | \\ \text{R}_n \end{array}$.
 4
 5

1 20. The method of claims 5 or 6 wherein said
 2 compound is further characterized in that Z is
 3 $\begin{array}{c} \text{=C-X'-} \\ | \\ \text{R}_p \end{array}$ or $\begin{array}{c} \text{-X'-C=} \\ | \\ \text{R}_p \end{array}$.
 4
 5

1 21. The compound of claims 7 or 8, wherein said
 2 compound is further characterized in that
 3 A) Z' is $\begin{array}{c} \text{=C-X'-} \\ | \\ \text{R}_n \end{array}$ or $\begin{array}{c} \text{-X'-C=} \\ | \\ \text{R}_n \end{array}$; and
 4
 5 Z" is $\begin{array}{c} \text{-Y-CH-} \\ | \\ \text{R}_p \end{array}$ or $\begin{array}{c} \text{-CH-Y-} \\ | \\ \text{R}_p \end{array}$; or
 6
 7 B) Z' is X; and Z" is $\begin{array}{c} \text{-Y-CH-} \\ | \\ \text{R}_p \end{array}$ or $\begin{array}{c} \text{-CH-Y-} \\ | \\ \text{R}_p \end{array}$; or
 8
 9 C) Z' is $\begin{array}{c} \text{=C-X'-} \\ | \\ \text{R}_n \end{array}$ or $\begin{array}{c} \text{-X'-C=} \\ | \\ \text{R}_n \end{array}$; and Z" is Y.
 10
 11
 12
 13
 14

1 22. The compound of claims 9 or 10, wherein said
 2 compound is further characterized in that Z is
 3 $\begin{array}{c} \text{-Y-CH-} \\ | \\ \text{R}_n \end{array}$ or $\begin{array}{c} \text{-CH-Y-} \\ | \\ \text{R}_n \end{array}$.
 4
 5

1 23. The compound of claims 11 or 12, wherein said
2 compound is further characterized in that Z is



1 24. The method of any one of claims 1-6, wherein at
2 least one of $\text{R}_a \rightarrow \text{R}_p$ is $-\text{OCH}_3$.

1 25. The compound of any one of claims 7-12, wherein
2 at least one of $\text{R}_a \rightarrow \text{R}_p$ is $-\text{OCH}_3$.